

Changes in Relative Abundance and Spatial Distribution of Dominant Overstory Taxa in an Old-growth Forest Over 30 Years

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Background

- Deciduous forests of eastern North America are undergoing a major shift in tree species composition.
- Hardwood species, such as oak (*Quercus* sp.) and hickory (*Carya* sp.) are failing to regenerate.
- Mesophytic species, such as sugar maple (*Acer saccharum*) and American beech (*Fagus grandifolia*) are becoming more abundant.
- This “mesophication” process will have important economic and ecological ramifications.

Methods

- Study site: Big Everidge Hollow, a 52-ha old-growth forest in SE Kentucky.
- Woody stems ≥ 2.5 cm diameter at breast height (dbh) were measured in 79 circular 0.4 ha plots in 1979, 1989, 1999, and 2010.
- Relative abundance and frequency were calculated for dominant taxa in three size classes: small (2.5–10 cm dbh), medium (10–25 cm dbh), and large (> 25 cm dbh).
- Nonmetric Multidimensional Scaling (NMDS) was used to assess whether overstory community types became less distinct through time.

Results

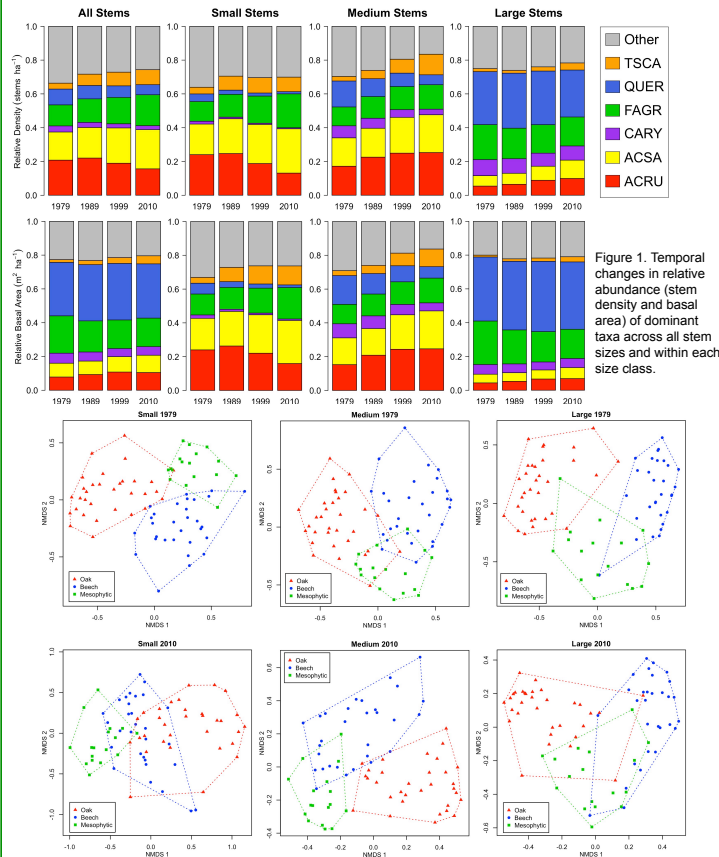


Figure 3. NMDS ordinations depicting dissimilarity among overstory community types for each size class in 1979 (top row) and 2010 (bottom row). Convex hulls (dotted lines) added to visualize overlap of community types. Community types were originally designated by Muller (1982).

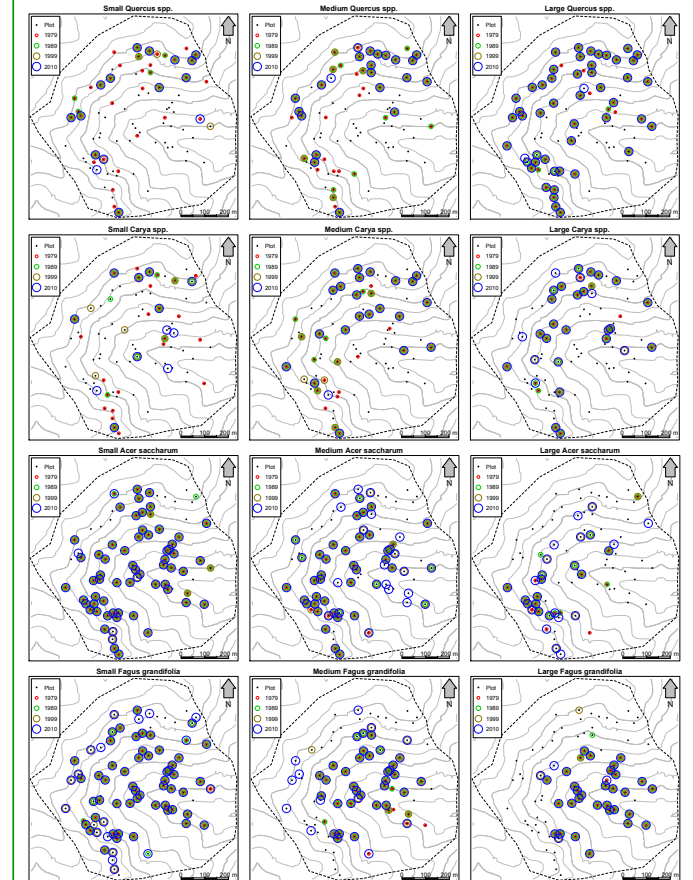


Figure 2. Frequency of dominant taxa over time within small, medium and large size classes. Colored circles indicate the presence of at least one individual in the plot in the corresponding year.

Conclusions

- Mesophytic species were increasingly abundant through time and will likely replace oaks and hickories, which have a decreasing presence in recruitment layers. Mesophication in BEH is thought to be driven by regional-scale climate trends.
- Forest composition is predicted to become more homogenous across environmental gradients as mesophytic species alter light, nutrient, and moisture availability in a positive-feedback that promotes mesophytic species.
- Drastic environmental changes associated with timber harvest can accelerate recruitment of non-oak species; oak-to-maple transition may occur faster in second-growth forests than old-growth forests.

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